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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

LU, KUEN S

ART UNIT	PAPER NUMBER
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2167

DATE MAILED: 08/29/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/783,124

Applicant(s)

STEENSGAARD ET AL.

Examiner

Kuen S. Lu

Art Unit

2167

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 February 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11 and 16 is/are rejected.
- 7) ☒ Claim(s) 12-15 and 17-20 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>3/4/2005</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. The Action is responsive to Applicant's Application filed February 19, 2004. Claims 1-20 are pending.

Information Disclosure Statement

2. The information disclosure statement (IDS) filed March 4, 2005 is considered complying with 37 CFR 1.98. 37 CFR 1.98(a)(2) and its electronically signed PTO-1449 is attached.

Drawings

3. The drawings, filed February 19, 2004, are considered in compliance with 37 CFR 1.81 and accepted.

Claim Rejections - 35 USC § 101

4. 35 U.S.C. § 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

4.1. As set forth in MPEP 2106 (II) (A):

The claimed invention as a whole must accomplish a practical application. That is, it must produce a "useful, concrete and tangible result." State Street, 149 F.3d at 1373, 47 USPQ2d at 1601-02. The purpose of this requirement is to limit patent protection to inventions that possess a certain level of "real world" value, as opposed to subject matter that represents nothing more than an idea or concept, or is simply a starting point for future investigation or research (Brenner v. Manson, 383 U.S. 519, 528-36, 148 USPQ 689, 693-96); In re Ziegler, 992, F.2d 1197, 1200-03, 26 USPQ2d 1600, 1603-06 (Fed. Cir. 1993)). Accordingly, a complete disclosure should contain some indication of the practical application for the claimed invention, i.e., why the applicant believes the claimed invention is useful.

Apart from the utility requirement of 35 U.S.C. 101, usefulness under the patent eligibility standard requires significant functionality to be present to satisfy the useful result aspect of the practical application requirement. See Arrhythmia, 958 F.2d at 1057, 22 USPQ2d at 1036. Merely claiming nonfunctional

descriptive material stored in a computer-readable medium does not make the invention eligible for patenting. For example, a claim directed to a word processing file stored on a disk may satisfy the utility requirement of 35 U.S.C. 101 since the information stored may have some "real world" value. However, the mere fact that the claim may satisfy the utility requirement of 35 U.S.C. 101 does not mean that a useful result is achieved under the practical application requirement. The claimed invention as a whole must produce a "useful, concrete and tangible" result to have a practical application.

4.2. Claims 1-20 are rejected under 35 U.S.C. § 101 because the claimed invention is directed to non-statutory subject matter.

As per claim 1, the claimed invention describes a system "for managing memory for an executing object-oriented program" where managing memory is the function the system performs. However, the claim body lacks functional descriptive material consisting of data structures and programs supporting or allowing computer to execute to produce a concrete, tangible and useful result. For example, the shape graph is not a functional descriptive data structure and is itself abstract. As a description of a partitioned memory having objects resided, an abstract data structure and a capability of identifying memory partition, the claim body is an abstract concept and does not produce a concrete, tangible and useful result. However, a tangible, concrete and useful result is required in a practical application test. The consequence is non-statutory.

As per claim 10, the claimed invention is a method for compiling program comprising steps of receiving code, point-to analysis, adding instrumentation to manage objects and regions, and compiling the program. The steps are abstract because "compiling the program" by itself and without a further performing step(s), such as storing the compiled

program on a computer readable storage medium, executing the compiled program or presenting the compilation status, the steps in combination does not produce concrete, tangible and useful result. A simple description of "the program configured to be executed in a system employing region-based memory-management" in the claim preamble does not preclude or remedy the claim from failing the test of practical application. The consequence is non-statutory.

As per claim 16, the claimed invention represents a computer-readable medium containing instructions for compiling a program. However, claimed "computer-readable medium" comprises wireless telecommunication signals and carrier waves, forms of energy. As forms of energy, the signals and waves are not a matter, composition of matter or product; and do not fall within any one of categories of patentable subject matter. For further rejecting the claim under 35 USC §103, Examiner interprets "computer-readable medium" as "computer-readable storage medium".

As per claims in the group 2-9, 11-15 and 17-20, the claims inherit the deficiency of being non-statutory from claims 1, 10 and 16, respectively and do not remedy the deficiency individually or by inheritance. The consequence is non-statutory.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. §102 that form the basis for the rejections under this section made in this Office action:

5.1. A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5.2. Claims 1-11 and 16 are rejected under 35 U.S.C. 102(b) as anticipated by Mellender et al. (U.S. Patent 4,989,132, hereafter "Mellender").

As per claim 1, Mellender teaches "A system for managing memory for an executing object-oriented program, the program comprising a plurality of objects" (See Abstract, Figs. 17-18 and col. 60, lines 19-47 where an object oriented programming language system is integrated with memory management system including memory regions, objects and database) and the system comprising:

"a computer-readable memory partitioned into a plurality of regions, each region containing at least one object" (See col. 60, lines 25-35 where contexts are assigned to memory regions and new region is started when a current region is filled with a maximum number of objects and a new context is created); and

"at least one region shape-graph describing relations between the regions, the relations based at least in part on references between objects contained in the regions" (See Figs. 17-18 and col. 60, lines 19-20 and 35-48 where objects are assigned to regions and regions are associated with processes such that objects associated with a process are assigned to some regions);

"such that given a reference to a target object, the region containing the target object can be identified by using information from the at least one region shape graph" (See Figs. 17-18 and col. 60, lines 19-20 and 35-48 where objects are assigned to regions and identified with region numbers).

As per claims 10 and 16, Mellender teaches "A method for compiling an object-oriented program, the program configured to be executed in a system employing region-based memory-management" and "A computer-readable medium containing instructions, which, when executed, cause a computer to compile an object-oriented program to be executed in a system employing region-based memory management" (See Abstract, Figs. 17-18, col. 2, lines 9-16 and col. 60, lines 19-47 where Alltalk tool compiles object oriented language source code and the tool, an object oriented programming language system is integrated with memory management system wherein objects assigned to memory regions are associated by process) comprising:
"receiving source code for an object-oriented program" (See col. 2, lines 9-16 where Alltalk tool compiles object oriented language source code);
"performing a points-to analysis on the source code to develop at least one data structure containing region association metadata for the program" (See col. 2, lines 40-44, col. 6, line 29 - col. 7, line 14 where source code is parsed to generate a parse tree passed to routines for analysis and code generation, and database manager is utilized by compiler wherein database a prime file storing objects and a key file storing metadata of prime file);

"adding instrumentation to the program, the instrumentation configured: to cause objects to be created in regions based on information in the data structure" (See col. 54, lines 37-41, col. 57, lines 14-26 and col. 58, lines 15-40 where object manager and buffer manager are utilized by compiler for fetching objects, storing objects in memory regions, locking objects in memory and tracking objects in the memory buffers); and "to cause deletion of all objects in a region when a determination is made that no objects in the region are referenced by any fields outside the region" (See col. 59, lines 55-68 and col. 62, lines 28-34 where unreachable objects are removed from database and garbage objects are collected based on context-region-process data); and "compiling the program" (See col. 7, lines 34-45 where each method is compiled and symbol file is updated with class information).

As per claim 2, Mellender teaches the following:

"the at least one region shape graph comprises a plurality of nodes connected by edges" (See Fig. 20 and col. 60, line 55 – col. 61, line 41 where a process ID is associated with region IDs in the in-use table and each region ID is associated with process IDs);

"each node represents a region in memory" (See Fig. 20 and col. 60, line 55 – col. 61, line 41 where each region in a process is a node to a process in the in-use table); and

"each edge represents one or more references between the objects of one region and the objects of another region" (See Fig. 20 and col. 60, line 55 – col. 61, line 41 where a

process ID links to a few region IDs wherein a region contains objects of different processes).

As per claim 3, Mellender teaches the following:

"identifying a first region in memory which contains an object which has a reference to the target object" (See Fig. 20-21, col. 60, lines 50-54, col. 61, lines 28-41 and col. 62, lines 6-26 where in the object in-use table objects for a process are chained in order of regions from highest to lowest and the entries point to the target object, and further a parent object refers to a child object via instance variable);

"identifying a first node in the at least one shape graph which represents the identified first region" (See Fig. 20-21, col. 61, lines 28-41 and col. 62, lines 6-26 where in the object in-use table objects for a process are chained in order of regions from highest to lowest and the entries point to the target objects);

"identifying the edge leading from the identified first node which represents the reference to the target object" (See Fig. 20-21, col. 61, lines 28-41 and col. 62, lines 6-26 where the chain connecting objects for a process is identified from one object to next in order of regions from highest to lowest and the entries point to the target objects);

"identifying a second node which the identified edge leads to" (See Fig. 20-21, col. 61, lines 28-41 and col. 62, lines 6-26 where the chain connecting objects for a process is identified from one object to next in order of regions from highest to lowest and the entries point to the target objects, for example, objects B-D are sequentially chained via entries 106-110 and object C is the second target); and

"identifying the region which is represented by the second node as the region containing the target object" (See Fig. 20-21, col. 61, lines 28-41 and col. 62, lines 6-26 where the objects in-use table having regions identified by the object entries, for example, target object B is in region 1, the second node).

As per claim 4, Mellender teaches "each region has a shape-graph associated with it and each shape-graph is stored along with the regions it is associated with" (See Fig. 20-21, col. 61, lines 28-41 and col. 62, lines 6-26 where each region is chained differently in according the residing objects and their association with process).

As per claim 5, Mellender teaches the following:

"a memory-management software module configured to determine, for a region, when no objects contained in the region are referenced by any fields outside of the region" (See col. 63, lines 23-45 where a region cleaning module to determine a region be cleaned based on the tracked number of objects accumulated in the region since last cleaning); and

"delete the region upon making such a determination" (See col. 63, lines 23-45 where a region cleaning module determines a region be cleaned based on a tracked number of objects accumulated in the region since last cleaning).

As per claim 6, Mellender teaches the following:

configured to determine when no objects are referenced comprises configured to keep a count for each region of the number of references made to objects contained in the region" (See col. 63, lines 23-45 where a region cleaning module determines a region be cleaned based on a tracked number of objects accumulated in the region since last cleaning); and

"upon determining that the count for a region is zero, determine that no objects contained in the region are referenced by any other fields" (See col. 63, lines 47-60 where region cleaner looks up region to be cleaned).

As per claim 7, Mellender teaches "comprising a garbage collector" (See Fig. 19 and col. 59, lines 40-68 where a garbage collector is included in the memory management system).

As per claim 8, Mellender teaches "at least one shape graph represents fewer than the total number of regions" (See Fig. 18 and 20 where the in-use table diagram shows less number of regions than a total number of regions).

As per claim 9, Mellender teaches "where no more than one region parameter is passed to a method for every object passed to a method" (See Figs. 17-18 and col. 60, lines 1948 where a set of objects are assigned to a region and an object is assigned to only one region).

As per claim 11, Mellender teaches "the data structure containing region association metadata comprises a shape graph" (See Figs. 20-21 where the graphs of in-use table and object tables, buffer, database and metadata show association of regions with processes and objects).

Allowable Subject Matter

6. Claims 12-15 and 17-20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten to overcome the rejections(s) under 35 U.S.C. § 101, and in independent form including all of the limitations of the base claim and any intervening claims.

Reason for Allowance

6.1. In Examiner's current action of 35 U.S.C. §102(b) non-Final Rejection for the instant application as described above is based on reference Mellender et al.:

"OBJECT-ORIENTED, LOGIC, AND DATABASE PROGRAMMING TOOL WITH GARBAGE COLLECTION", U.S. Patent No. 4,989,132, issued January 29, 1991.

The Mellender reference provides an object oriented programming tool that integrates object-oriented and logic programming, database facilities and an improved garbage collector which employs a concept of regions garbage collection.

The Mellender reference teaches partitioning memory in regions and providing shape-graph describing relations between regions, objects in regions and identifying target object by using shape graph information.

However, Mellender reference does not teach the combined subject matter of "creating shape graph defined by parameter alias sets which are created and unified

based on object-oriented program statements; and associating shape graph with memory regions” or “creating region, given a shape-graph; allocating object within region, given an object and a region; and identifying region reference, given region and identifier”, as described in each claim in groups (12, 17) and (13,18), respectively.

After a thorough search for the prior art conducted on EAST database and domains (NPL-ACM, Google, NPL-IEEE), and a detailed examination of the search results, Examiner is convinced that the prior art searched and made of record does not teach the combined subject matter of further combining partitioning memory in regions and providing shape-graph describing relations between regions, objects in regions and identifying target object by using shape graph information with the subject matter of “creating shape graph defined by parameter alias sets which are created and unified based on object-oriented program statements; and associating shape graph with memory regions” or “creating region, given a shape-graph; allocating object within region, given an object and a region; and identifying region reference, given region and identifier”.

Conclusion

7. The prior art made of record

A. U.S. Patent 4,989,132

7.1 The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

B. U.S. Patent 6,964,037

C. U.S. Patent Application 2005/0234985

D. U.S. Patent 6,839,895


E. U.S. Patent 6,865,657

F. U.S. Patent 6,249,793

Contact Information

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kuen S Lu whose telephone number is (571) 272-4114. The examiner can normally be reached on Monday-Friday (8:00 am-5:00 pm). If attempts to reach the examiner by telephone are unsuccessful, the examiner's Supervisor, John Cottingham can be reached on (571) 272-7079. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for Page 13 published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 886-217-9197 (toll-free).

Kuen S. Lu 

Patent Examiner, Art Unit 2167

August 24, 2006